

Supplemental Material

CBE—Life Sciences Education

Pfeifer *et al.*

Supplemental File 1. Interview protocol

1. Tell me about yourself, what is your major and year in school?
2. Walk me through how the accommodation process works from the start of the semester to the end of the semester.
3. Think back to your first semester in college. Tell me about your experience in learning how to request academic accommodations.
4. How did this experience compare to your experience with accommodations in high school?
5. Who, if anyone, helps you with accommodations in college? What kind of help do they provide?
6. Tell me about a time you decided not to use accommodations in a course or a semester. Describe your thought process in making this decision.
7. What do you do when your accommodations are not working in a course? Who do you talk to?
8. What advice would you give to an incoming student about learning to request and use accommodations?
9. *I want to talk with you about self-advocacy. Self-advocacy has different meanings to different people. I think of self-advocacy as speaking up to tell those around you about your disability to help them understand what accommodations you need to access the learning material or activities in class, including requesting accommodations from the DRC. What does self-advocacy mean to you?*
10. In your email, you mentioned that you have taken a STEM course to meet the Science and/or Quantitative Reasoning Core Curriculum requirement. Which course(s) did you take?
11. Tell me how your disability affects you when you are in a STEM course.
12. What accommodations do you typically use in STEM courses?
13. How do you self-advocate in a STEM course?
14. How does self-advocating in a STEM course compare to self-advocating in a different type of course?

15. How do you decide to tell your instructor about your disability in a STEM course? Walk me through your thought process.

Possible prompts to use for follow-up:

You mention _____, tell me more about that.

You mention _____, can you give me an example of that?

You mention _____, what was that like for you?

Note: We have omitted six interview questions from the end of this protocol because they will be used for data collection for a different study.

Supplemental File 2. Factors influencing self-advocacy codebook. Example data has been lightly edited for clarity. Brackets indicate words added, or long pauses during the interview. Ellipses indicate words removed for conciseness. Codes related to development of the model of self-advocacy are provided in Pfeifer et al., 2020.

*Asterisks indicate codes we previously published, but also include here because of their importance in informing our understanding of the factors that influence self-advocacy.

Major code	Subcode	Description and notes	Example data
Practicing self-advocacy before coming to college		Participant describes how they practiced self-advocacy before starting college.	See subcodes below.
	Attending accommodation meetings in high school	Participant describes attending their own accommodations meetings in high school. <u>Note:</u> These are typically called IEP meetings or 504 meetings. IEP stands for Individualized Education Plan and 504 refers to Section 504 of the Rehabilitation Act of 1973.	"...As soon as I got into the [IEP] meeting, I got used to it." -Ryan
	Asking teachers for extra time to finish tests in high school	Participant recalls having to work with teachers individually to get extra time on tests in high school. <u>Note:</u> Official accommodations may or may not be in place.	"...if I needed a few extra minutes, the [high school teachers] were always willing to let me stay." -Oakley
	At a previous college	Participant describes how they practiced self-advocacy at another college before transferring to current institution.	"So when it came time to take my first test, [my STEM instructor] did not allow me to set it up with the testing services. He really pressured me to take it in class and I was like, and that resulted in a really, really low score. Because of that, I discussed with their disability office what had happened.

			<p>They had asked me if I wanted to take it further and file a complaint. I didn't, because he still was in control of my grades. Like I said, he's an interesting man, so I didn't know what the results of that would have been...I just was like, "Just so that you guys are aware." So after that, they I think sent him an email that they didn't tell him that I talked to them. I think he got an email just saying, "I think it's required by law for you to provide accommodations for your students." After that, I was able to use my accommodations, but it's definitely an interesting experience." -Mia</p> <p><u>Note:</u> This participant quote is double-coded with STEM instructor as a barrier, subcode actively discriminates</p>
Did not practice self-advocacy before college		Participant explains that they did not practice self-advocacy before coming to college.	<p><u>Talking about what her mom did for her in K-12 classrooms.</u> "...If she saw I was struggling, she would go talk to the teachers."-Dana</p>
Recognizing a need for official accommodations		Participant shares a story about how they recognized they needed accommodations. This can be in high school or college.	<p>"I was getting really frustrated with my grades not reflecting what I'm capable of. And after enough of that I was like I want to do something about this." -Cassie</p> <p><u>Listening back over recorded class session.</u> "When I went back and listened to it, and I missed over 30 minutes of class just from zoning out or wondering what somebody's talking about or something like that." -Wyatt</p>
Asking for help before officially registered with the DRC		Participant shares a story of reaching out for help when they recognized a need for accommodations.	<p><u>Receiving a DRC referral from another campus student support office.</u> "I just came to [college], took a couple math tests, was like, I need more time. I talked to the CRC person about it. They were like, talk to the DRC. I talked to them and got it figured out. I guess more to your point, I didn't know that the DRC existed..."-Cassie</p> <p><u>Note:</u> Possible examples include working with a counselor, or working with an instructor who encouraged them</p> <p><u>Note:</u> The CRC is the Collegiate Recovery Center.</p>

		to get tested or connected to the DRC, etc.	
Learning about disability		<p>Participant describes what it was like for them when they first learned they had a disability, or how they felt reviewing their official testing paperwork.</p> <p><u>Note:</u> This includes both official and unofficial means to learn about disability, i.e., receiving a formal diagnosis or an experience that taught them about themselves as a learner with a disability.</p>	<p><u>Receiving formal diagnosis.</u> “Then I went to a psychologist...And he was like, ‘Oh yeah, this is ADHD. For sure.’ I was really relieved, because I was like oh, it’ll be a lot easier to fix this [than changing all the stress I have] ...I thought I was just gonna get medicated and I would be back and better than ever, but it’s not really that way, at all.” -Kendra</p> <p><u>Reading official testing report.</u> They came up with this report that really accurately describes how I struggle in a lot of different academic areas and just like how my brain functions generally...there were observations that I notice about myself and they had in this report without me telling [them] at all.” -River</p>
DRC teaches how to request accommodations		Participant talks about learning how to request accommodations in college through the DRC.	<p><u>Talking about his first DRC meeting.</u> “...they were just like, this is what you need, this is what we can offer you. They would tell me one of the accommodations, like actually it might be a little bit better if you did this, notetakers are awesome but sometimes they don’t take very good notes. I’d rather you record lectures and stuff like that...”-Carter</p>
Being taught by an older adult how to self-advocate		<p>Participant describes how their parents or other trusted adult helped them learn to practice self-advocacy when they were younger.</p> <p><u>Note:</u> Most of the time this will be their parents, but could be a teacher, tutor, etc.</p>	<p>“Yeah, so my parents were very big advocates on assisting me with setting up accommodations [in K-12] ...They were definitely very big on helping me set-up a 504 plan and making sure I was talking and communicating with my teachers for what I needed.” -Mia</p>
Parents “push”		Participant	“My mom recommended that I go take

student to sign up with DRC		describes their parents being a "major" factor or "forcing" them to sign up for accommodations in college.	testing accommodations...because technically I have a disability." -Ryan
Planning for accommodation use each semester		Participant describes how they generally approach their accommodations for the semester.	"I primarily use all of my accommodations."-Mia
	Description of how accommodation letters are sent to professors	Participant describes how they generally approach their accommodations for the semester. <u>Note:</u> If they say they have trouble planning for the semester, code this as knowledge of self. Possible examples include they send out accommodation requests to every instructor, they pick and choose classes, or they wait until they take the first exam. Don't use this code for lack of plan.	"I go through all of my syllabuses and find all the dates of my exams and papers and stuff, and I'll write them all down in my agenda. Then I'll go onto the DRC login portal that I have saved in a favorite on my computer so I can find it easily, and I will then just go through and get the letters of approval for each class..."-Heath
	Description of strategy for scheduling exams	Participant explains how they schedule their extended time exams, can be at DRC or with instructors.	"Sometimes at the beginning of the semester. I'll go in and submit all of my tests as soon as I get my syllabus, which usually works out well." -Eli After getting the letters of approval from each class, it takes about a day for them to come back, then I schedule all of the exams. I just go one class, start to finish. Next class, start to finish. Start to finish, start to finish. All the exams, all of the finals. Then just go through the

			semester...” -Heath
	Using accommodations besides extended time exams	Participant describes how they plan and use accommodations besides extended time exams. <u>Note:</u> Possible examples are notetaking accommodations, scantron accommodations, alternative textbooks, etc.	I have a note taking accommodation, but I don't really use it, because I feel like if I had somebody taking notes for me I would never show up to class. I know, that's not the case for other people, but also I don't really trust other people's notes as much as I trust my own, because I know what I need to have written down. I like everything super written down. And I'm worried that I might miss [something].” -Kendra
	“Better to have more than less accommodations”	Participant says that they plan to use all their accommodations because it's better to have more and not need them, then to ask later.	“It's better to have more accommodations and then just not use them to have less accommodations and be struggling.”- Mia
Support network provides emotional support		Participant describes some sort of supporting individual or network of individuals that help them feel comfortable discussing their disability or accommodation issues.	“I had friends that were getting accommodations here too...”-Opal
Support network fosters self-advocacy		Participant describes how someone helps or helped them practice self-advocacy, including learning about available accommodations, or practicing self-advocacy.	“I still discuss it with my parents...”- Mia “The day of I was panicking, freaking out, and my friends helped me figure out what to do.”-Kendra
STEM instructor supports self-advocacy*		The instructor supports participant self-advocacy by being perceived	<u>Instructor affirms accommodation use:</u> “He kind of said like with [my upper-division math course] time isn't a concern, because you can solve a problem for years, so I shouldn't be

		as approachable, when the instructor affirms use of accommodations in their course, and when the instructor helps the student use their accommodations in the course.	worried about it. So, he gave me... a concrete example of like why I shouldn't be worried." -Aaron
STEM instructor as a barrier			
	Not perceived as open	Participant perceives their instructor to be judgmental of their accommodation use.	"He seems kind of judgmental, so the more judgmental the more uncomfortable I feel."-Aaron
	Not informed about disabilities or accommodations	Participant describes a time when their instructors were not informed about how accommodations work at the location data collection occurred.	"I think it was his first time teaching, and he was like, 'Oh, yeah, I don't really know anything about that..."-Kendra
	Neglectful of student	Participant describes that their instructors do not respond to their accommodation requests in a timely manner or do not consider them in the design of the classroom. <u>Note:</u> Examples include instructors not responding to official DRC notification letters or emails about accommodations, instructors using	"That's what's frustrating, is some of them never submit the agreement [acknowledge accommodation letter sent from the DRC]." -Opal

		pop quizzes at the start of class with no considerations in place for those using exam accommodations, etc.	
	Actively discriminates	Participant describes a time when their instructor denies them accommodations, or has a negative attitude or action towards the student because they use accommodations.	"...he denied me my accommodations." -Mia
	Violates privacy	Participant describes a time when their instructor violated their privacy by telling others or implying to others that the participant uses accommodations.	"When I take a test at the DRC, a lot of times the [instructor] has to pick it up or they'll give it to the [instructor]. Sometimes I have to drop off the test, depends on what the [instructor] puts down for how they want me to return it or if they're gonna pick it up. This [instructor] I guess did the option where he picks it up, and he would forget. I think we had three tests, and each time he would pass back tests he would say, 'Oh Megan I haven't had a chance to go to the DRC to get your test, sorry I always forget.' And this would be in front of the whole class, and I was uncomfortable with that." -Megan
	Doesn't want to burden instructor	Participant perceives accommodations as a burden for their instructor, so they do not pursue them or ask their instructor for help if problems with accommodations arise.	Because you're basically telling them I need extra time and I don't know how they feel about that. Because that's extra work for them, I know that. Especially if they don't have [teaching assistants]."-Dana
Peers as barrier in a STEM course		Participant describes their peers as a barrier	<u>Close friend thinks accommodations are unfair.</u> "So it was actually my roommate my freshman and

		<p>to their self-advocacy, includes experiences with a close friend or roommate.</p> <p><u>Note:</u> May also be double coded with stigma of disability.</p>	<p>sophomore year. We took a lot of the same courses...she made this comment like people who just get accommodations to get extra time, they don't really earn that grade." - Oakley</p> <p><u>Peers as unsupportive.</u> "I always feel like I have to defend myself in a way..."Oh, she gets extra time" and that to the class, "No wonder she got a better grade than everyone."-Opal</p> <p><u>Responding to peers with self-advocacy.</u> "Yeah, she did. She took it and with her own hands, because she was struggling, to go and ask for help and figure that out for herself, so what's your problem with it? If you want extra time, go get tested and go figure it out for yourself, but don't just sit around and bag on someone about that." -Opal</p>
Logistics of accommodations prevent utilization		<p>Participant describes how the logistics of their accommodation act as a barrier to their self-advocacy or use of accommodations.</p> <p><u>Note:</u> Only use major code if unable to decide on subcode.</p>	See subcodes below.
	Avoiding exam day reveal to peers	Participant does not want to take their exams at the DRC because they don't want their peers to notice they are gone from the classroom on the day of the exam.	<p><u>Deciding not to use extra time.</u> "...maybe sometimes people [peers] will like text me, 'where were you during the exam?' Then it's like I have to explain, so that makes me self-conscious." -Aaron</p>
	Doesn't want to talk about accommodations	Participant does not want to talk to their instructors or a peer about accommodations,	<p><u>Talking about stopping use of accommodations.</u> "I would only take the accommodation if the email processed and I didn't have to talk to</p>

		so they do not request or use their accommodations.	anyone about it.”-Aaron
	Wants to ask questions during the exam	Participant does not like to test at the DRC because they cannot ask instructors questions on the exam.	<u>Taking an exam at the DRC.</u> “So I was sitting in the DRC, I was like ... I mean, I can ask the DRC to ask a question for me, but if the teacher's not available by email or phone, then there's nothing they can do. So that's kinda rough.” -Kendra
	ADHD medication issue	Participant avoids taking their ADHD medication for class or exams because of the side effects of the medication.	<u>Describing how scheduling extended time exams affects medication schedule.</u> “Next week, I have my Genetics and Organic Chemistry test(s), one after the other. I take [ADHD] medications to help myself focus, but since the O chemistry people don't want me to have taken the test before anyone else has started taking the test, the earliest I can take it is 4:45 PM, which would mean I would have to take more medication later in the day, which would inhibit my ability to sleep well that night, and most likely affect my performance on my Genetics test the next day...I got [my Organic Chemistry test] moved as early as I could so I would not be up until 4:00 in the morning.” -Henry
DRC as barrier		Participant says that their DRC coordinator was not helpful for them. <u>Note:</u> Also use this code when an inaccurate idea of the accommodation process rises to the level of a barrier.	“That’s why it was weird talking to him, because I felt like he was just treating me like a little kid.” -Dana
Intersectionality		Participant describes how other identities influence their	“...because guys, oh my...they're so judgmental in engineering. They think every girl's dumb and they treat you as such. So I think it is kind of like a

		<p>feeling of belonging in STEM and willingness to talk about disability and pursue academic accommodations.</p>	<p>don't show fear...I mean not fear, but you know don't let them know you're weak or something." -Dana</p> <p>"Especially with black men, there's a lot of hyper masculinity and mental health or being sad or expression emotion or concern for yourself is seen as weakness." -Carter</p> <p>...I guess because women are less represented in the field...it's just an intimidating environment in general. It's just the way I was raised and stuff, just fighting through a lot of that and trying to get over gender stereotypes and whatnot."-Cassie</p>
Opting out of accommodations		Participant describes their reasoning for not using academic accommodations.	<p>"An accommodation that is an option is the note-taking thing. I just never had that in high school, so I think coming to college, I was like, I don't know what this is. I just opted out of that every semester for every class..." -Cassie</p>
Clear career aspiration		Participant describes a clear STEM or STEM related career aspiration.	<p>"I have thought up until this year that I wanted to get my PhD in genetics and do research for a living, but now I've decided that I actually want to go to medical school." -Oakley</p>
Stigma of disability*		<p>Participant discusses their perception of disability in the context of undergraduate STEM courses. This includes how STEM instructors, and peers view disability and accommodation use in the context of undergraduate STEM courses.</p> <p><u>Possible examples are:</u> -ADHD over-diagnosed or not a real disability -People who use</p>	<p>"Sometimes I do tell them, talk to my friends and stuff. I think ... I don't think they really care. Like, you know? Just because like I said, people have their opinions about ADHD, so a lot of times when I mention it, it's always like a very snide comment on how ADHD is a made-up thing, and really kids just need to go outside, or you know? I don't know, it just seems very negatively viewed." -Dana</p> <p>"The stigma is primarily like people joke a lot about dyslexia...There is a negative stigma...[the] stigma seems like it's making people who have dyslexia out to be less intelligent than the average person just because their brains process information in a different way."-Mia</p>

		<p>accommodations are not smart -Accommodation use is unfair</p>	<p><u>Asking instructor about their view of accommodation use.</u> “Do you think this makes me look like a lesser student?” -Aaron</p>
<p>Feeling/perception of using accommodations or having a disability *</p>		<p>Participant describes how they felt about using accommodations, or their perceptions of what accommodation use is like in college.</p>	<p>“[Accommodations] level the playing field”-Oakley “Just at the beginning I guess I was nervous about asking, or telling a professor. I wasn't nervous about telling them I had the DRC, just about missing class and asking for something different.”-Jake</p>

Supplemental File 3. Other individuals influence self-advocacy

Family as a support

We found numerous examples of how families supported the self-advocacy of our participants. Many of our participants reported that several of their immediate family members also have a disability, and this helped our participants develop their own self-advocacy. Tamrin elaborated,

“Everyone in my family has a learning disability...all of my sisters went to college here so they’ve been through it, so it was easier for me because I knew what to expect...My sisters knew about the notetaking accommodation and the audio books so they told me to ask for them...They just knew everything that was available, so I knew more of what to ask for.”-Tamrin

Tamrin’s family served as a support for her self-advocacy because their previous experiences with the accommodation process informed her accommodation decisions in college. Some of our participants were the only person in their family to have a diagnosed disability. In these cases, families often provided general emotional support that helped self-advocacy. Other participants like Mia explained that their family supported their self-advocacy by providing advice regarding accommodation issues. Mia stated,

“I still discuss it with my parents, but I’m the primary decision maker about my accommodations...I’ll talk to my parents and be like, ‘Hey, these ones are available. Do you think that these would be beneficial?’ I use them as a back-up resource just as a confirmation, because they know me.”-Mia

Mia shared that she talks about accommodation issues she experiences with her parents because they know Mia's strengths and weaknesses as a learner with a disability. Mia valued their input because they help her to feel confident in her accommodation-related decisions.

For many of our participants, their parents played an important role in helping them initially establish accommodations in college, and this was a support for their self-advocacy. We found that several participants credit their parents as the sole reason they pursued accommodations at the start of their college career. Eli shared that his parents told him that he needed to register with the DRC because he needed to keep his grades up in college. Eli stated, "My parents said, 'If your grades fall, then we're going to hammer you.' That evidently got me into the door at the DRC." Two more of our participants explained that their mothers encouraged them to register with the DRC. Judd and Ryan shared that they felt reluctant to register with the DRC at first. Judd noted this was because the word "disability" was in the name of the DRC. Judd and Ryan credit their mothers as the primary reason they use accommodations in college.

Another participant, Henry, reported that his mom helped him plan for his initial accommodation meeting by helping Henry write a list of accommodations he wanted to request in the meeting. Henry also explained that his mom attended the meeting with him to help him communicate with his DRC coordinator. Henry stated,

"We had it planned out. I would explain as much as I could. Then she'd have everything that we wrote out on my accommodation list, and if I

missed anything, she helped cover those accommodation requests.”-

Henry

It is important to note, that Henry had to sign a waiver granting the DRC permission to discuss his accommodations with his mom, due to the Family Educational Rights and Privacy Act (FERPA), which protects the privacy of student educational records once students turn 18. In this example, Henry’s mom directly supported his self-advocacy by helping him develop a plan for his initial accommodation meeting. Henry’s mom further supported his self-advocacy by attending the meeting with him, and ensuring all his accommodation needs were discussed. Family served as a vital support of self-advocacy for many of our participants. But this was not the case for some participants, whose families hindered their self-advocacy.

Family as a barrier

A few of our participants described how their families functioned as a barrier to their self-advocacy. In some cases, families prevented participants from accessing accommodations, failed to instruct students how to self-advocate in high school, and appeared to lack empathy. One example of families preventing access to accommodations comes from Hunter. Hunter reported that he showed symptoms of ADHD in high school. He asked his parents if he could be tested for ADHD to receive accommodations, but he was not allowed to be tested because his “[parents] didn’t believe in it.” Hunter explained that his parents did not view ADHD to be a real disability, and that without accommodations he struggled academically in high school. Hunter, however, was able to access

accommodations in college. He was formally tested for ADHD one month after starting college, and began using accommodations soon after. Dana was another participant who described how her family hindered her self-advocacy. Dana shared that throughout elementary, middle, and high school her mom intervened on her behalf whenever Dana encountered a problem related to ADHD. Dana reported, "... [my mom] would step in most of the time if she saw there was a need to help. So I think that's why I kind of struggle a little bit [with self-advocacy in college]." Dana felt her self-advocacy was hindered, partly, because her mom did not provide opportunities for Dana to learn how to self-advocate in high school.

Another participant, Kendra, explained that her family sometimes hindered her self-advocacy in college because Kendra perceived her parents not to understand her experiences as a college student with ADHD. Kendra elaborated,

"I've tried to talk to [my parents] before, especially freshman year... a lot of times they don't really understand how I could let myself get in certain situations in the first place. They're like, 'Why would you even do that? How can you get yourself into a situation where you have three papers that are overdue?'"

For Kendra, she felt reluctant to communicate with her parents about self-advocacy. She had to find other individuals, like her friends or academic coach, to communicate with about self-advocacy and accommodation issues because she felt her parents tended to lack empathy. Besides families, our participants

also described how professionals within the university supported or hindered their self-advocacy.

Professionals as a support

We now explain how professionals supported the self-advocacy of our participants. Almost all participants described their DRC coordinators as a support for their self-advocacy. Besides DRC coordinators, both Wyatt and Kendra found professionals with similar disabilities to their own to be supportive. For Wyatt, who was diagnosed with ADHD in college, he became motivated to practice self-advocacy by an academic counselor who also had ADHD. His counselor helped him see that, “Having ADHD is not a big deal. It’s just something you’re gonna have to live with and learn how to deal with.” Wyatt shared that this conversation helped him feel comfortable to talk to his STEM instructors about accommodations because that is how he “deals” with ADHD.

Another participant, Kendra, explained that she feels more comfortable talking to her academic coach than her parents about accommodation issues because her academic coach has the same disability. In our study, Kendra was the only participant who reported meeting with an academic coach each week. Kendra explained that she was able to access an academic coach on her own, not through any services or offices associated with the university at the time data collection occurred. Kendra shared that her academic coach would help her develop a plan each week to complete coursework, as well as, make suggestions on how to manage her accommodations. Kendra stated that her academic coach, “also has ADHD. So, she understands from that point of view.” Kendra

explained that her academic coach helped her navigate the accommodation process by determining when and how to communicate with her STEM instructors, and her DRC coordinator when Kendra experienced an accommodation-related issue.

Professionals as a barrier

Although many of our participants found their DRC coordinator to be supportive of their self-advocacy, one participant did not. Dana explained that she did not find her DRC coordinator to be helpful in her initial accommodation meeting, which hindered her self-advocacy. This perception of her DRC coordinator influenced her decision not to use accommodations in her STEM courses. Dana described talking to her DRC coordinator was like, “talking to an answering machine...it gives you your options and you got to pick one.” Dana felt as though she had to choose her accommodations from a list, without much, if any, personal input about her needs and wants as an individual. This experience in her initial accommodation meeting discouraged her from communicating with her DRC coordinator, and from using accommodations in her courses.